3.3 – Proving Lines Parallel

Which lines or segments are parallel? Justify your answer.

1)

Lines *d* and *e*
Converse CA

2)

$\overrightarrow{AB} \parallel \overrightarrow{DC}$
Converse AIA

3)

$\overrightarrow{RP} \parallel \overrightarrow{SQ}$
Converse AEA

4)

$\overrightarrow{AC} \parallel \overrightarrow{BD}$
Converse CA

5)

t ∥ *u*
Converse AEA

6)

b ∥ *e*
Converse CA
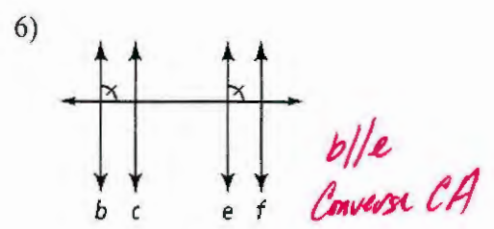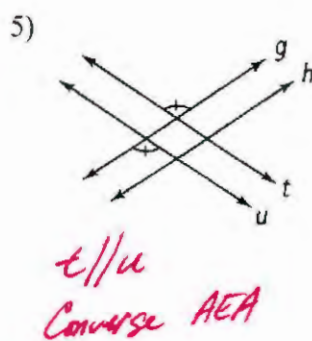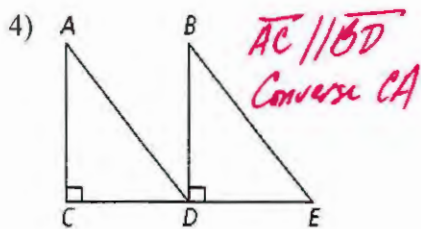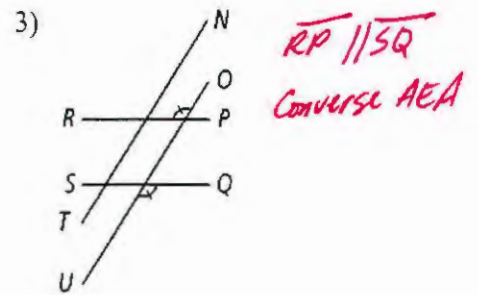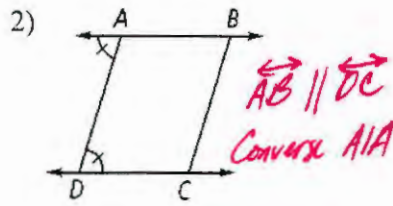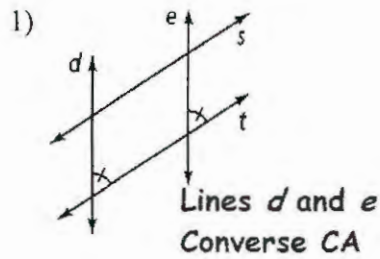
Determine the value of *x* for which *r* ∥ *s*. Then find the measure of each labeled angle.

7)

$42°$
$(2x + 6)°$
$42°$

$x = 18$

8)

$98°$
$(3x - 17)°$
$82°$

$x = 33$

9)

$54°$
$(2x + 20)°$
$126°$
$(6x + 24)°$

$x = 17$

10)

$132°$
$(2x + 2)°$
$(3x - 63)°$
$132°$

$x = 65°$

11)

r

s

140°

40° (5x − 5)°

$x = 9$

12)

68°

(4x − 8)°

112°

r   s

$x = 19$
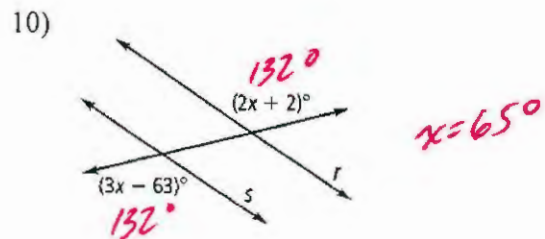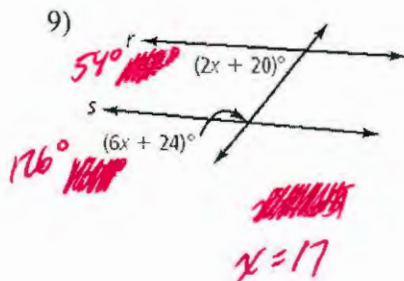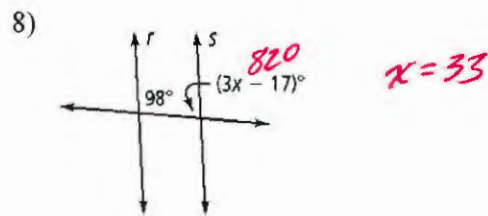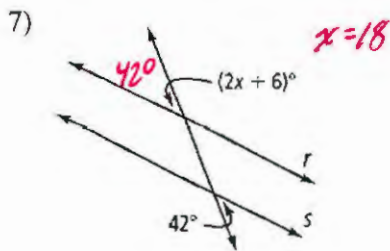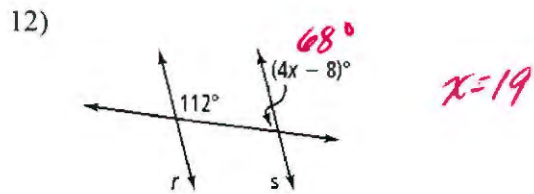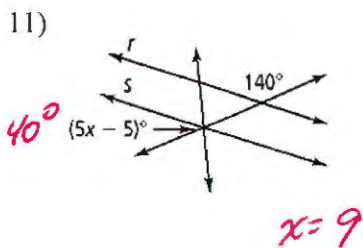
Use the given information to determine which lines, if any, are parallel. Justify each conclusion with a theorem or postulate.

13) $\angle 11$ is supplementary to $\angle 10$.

$t \| u$, converse SSI

14) $\angle 6 \cong \angle 9$

$a \| b$, converse AIA

a

b

1 2 3 4
5 6 7 8
9 10 11 12
13 14 15 16

t   u

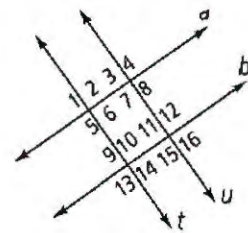15) $\angle 13$ is supplementary to $\angle 14$.

No lines $\|$
Just a linear pair

16) $\angle 13 \cong \angle 15$

$t \| u$, converse CA

17) $\angle 12$ is supplementary to $\angle 3$.

$a \| b$ $\angle 12$ is supp to $\angle 11$
Converse CA

18) $\angle 2 \cong \angle 13$

$a \| b$, converse AEA

Use the diagram to answer the following.

19) Find the values of x, y, and z That makes $p \| q$ and $q \| r$. Explain your reasoning.

p   q   r

78°   78°

(4x − 30)°   (6y)°

3(x − 1)°   6(z + 8)°   s

102°

$3(x-1) = 4x - 30$

$3x - 3 = 4x - 30$
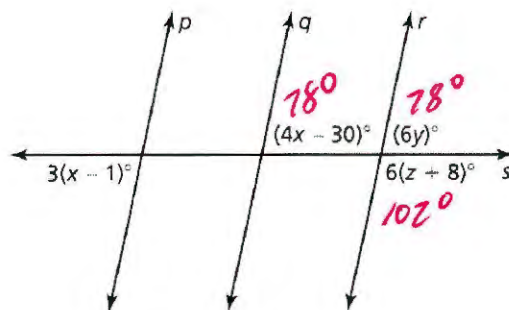
$\boxed{27 = x}$

Congruent $\angle$'s

$6y = 78$

$\boxed{y = 13}$

Congruent $\angle$'s

$6(z+8) = 102$

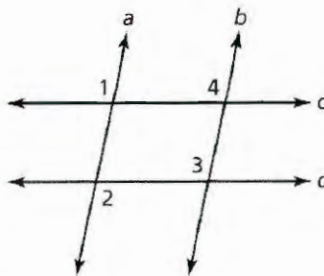$z + 8 = 17$

$\boxed{z = 9}$

102 is the supplement of 78°

20) Is $p \| r$? Explain your reasoning.

If $p \| r$ and $q \| r$, then $p \| r$ by the transitive property

21) Write a two-column proof.

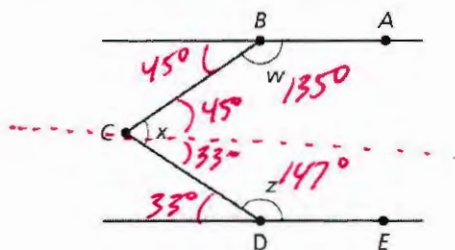Given: $\angle 1 \cong \angle 2$ and $\angle 2 \cong \angle 3$

Prove: $\angle 1 \cong \angle 4$

| Statement	Reasons
1. $\angle 1 \cong \angle 2$ and $\angle 2 \cong \angle 3$	Given
2. $c \parallel d$	Converse AEA
3. $\angle 3 \cong \angle 4$	CA
4. $\angle 2 \cong \angle 4$	Transitive Property
5. $\angle 1 \cong \angle 4$	Transitive Property

22) $\overline{AB}$ is parallel to $\overline{DE}$, $m\angle w = 135°$, and $m\angle z = 147°$. Find $m\angle BCD$.

$x = 45 + 33$

$x = 78°$

23) Point R is not in plane ABC.

   a. How many lines through R are perpendicular to plane ABC?   1

   b. How many lines through R are parallel to plane ABC?   Infinite

   c. How many planes through R are parallel to plane ABC?   1
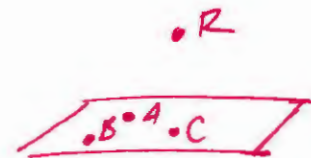
24) In the diagram to the right, $e \parallel d$, $g \parallel f$, and $a \parallel b \parallel c$. Find the following.

   a. $m\angle 1 = $ $137°$

   b. $m\angle 2 = $ $71°$

   c. $m\angle 3 = $ $137°$

   d. $m\angle 4 = $ $43°$

   e. $m\angle 5 = $ $71°$